



Extension of the distribution of *Megalechis thoracata* (Valenciennes, 1840) (Siluriformes, Callichthyidae) to the basin of the Itapecuru River, northeastern Brazil

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Abstract

The geographic distribution of *Megalechis thoracata* is extended to the basin of the Itapecuru River, based on a specimen collected in the Soledade stream, a tributary of the Itapecuru, located in the Inhamum Municipal Environmental Protection Area in Maranhão, Brazil.

Key words

Palm swamp; stream; Callichthyinae; Cerrado; Maranhão.

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Introduction

The catfish species of the family Callichthyidae are characterized by 2 longitudinal series of lateral dermal plates. The family contains 217 recognized species, divided between the subfamilies Callichthyinae Bonaparte, 1835 and Corydoradinae Hoedeman, 1952 (Reis 2003, Eschmeyer 2017). The Callichthyinae includes 5 valid genera—*Callichthys* Scopoli, 1777, *Dianema* Cope, 1871, *Hoplosternum* Gill, 1858, *Lepthoplosternum* Reis, 1997, and *Megalechis* Reis, 1997 (Reis 1998, 2003)—that can be differentiated from those of the Corydoradinae by the presence (vs absence) of a spine in the anal fin. *Megalechis* can be distinguished from the other callichthyines by a number of exclusive traits, including exposed infraorbital bones (vs covered by a thick layer of skin), caudal

fin truncated or with convex distal edge (vs bifurcated or with concave distal edge), and the presence of 2 (vs 1) unbranched rays in the dorsal fin. The genus currently includes 2 valid species—*Megalechis picta* (Müller & Troschel, 1849), which is found in the basins of the Amazon, Orinoco, and Essequibo rivers, as well as the coastal rivers of northeastern Brazil, and *Megalechis thoracata* (Valenciennes, 1840), which occurs in the Amazon and Orinoco basins, as well as the coastal rivers of the Guyanas and northeastern Brazil (Reis et al. 2005).

In recent decades, this group has been the subject of a number of taxonomic rearrangements, which resulted in the revalidation of *M. picta*, and the synonymization of *Megalechis personata* (Ranzani, 1841) with *M. thoracata*. *Hoplosternum thoracatum* was initially transferred to *Megalechis*, which also included *M. personata* (Reis



Figure 1. *Megalechis thoracata*, MZUEL 15410. Scale bar = 2 cm.

1997). Reis et al. (2005) subsequently examined the holotypes of *Callichthys thoracatus* and *Callichthys longifilis* Valenciennes, 1840, and then revised and rediagnosed the *Megalechis* species, considering *M. personata* to be a junior synonym of *M. thoracata*, while *M. picta* was confirmed as a valid species.

Based on the analysis of a single specimen collected from a stream in the Inhamum Municipal Environmental Protection Area (Inhamum MEPA), which is a tributary of the Itapecuru River, the geographic distribution of *M. thoracata* is extended to the Itapecuru basin in Maranhão, Brazil.

Methods

The specimen of *M. thoracata* (Fig. 1) was collected in September 2015 in the Soledade stream (Fig. 2), a tributary of the Itapecuru, located within the Inhamum Municipal Environmental Protection Area, or Inhamum MEPA (04°53'26.9" S, 043°25'10.0" W), in the municipality of Caxias, in the Brazilian state of Maranhão (Fig. 3). The map was produced in the Quantum GIS program, version 2.18. The specimen was captured in a dragnet with a PVC (polyvinyl polychloride) frame and taken to the Genética e Biologia Molecular Laboratory (GENBI-MOL) of the Centro de Estudos Superiores de Caxias, Universidade Estadual do Maranhão (CESC/UEMA). A small sample (ca 20 mg) of muscle tissue was taken from



Figure 2. The Soledade stream where the *Megalechis thoracata* was collected.

the specimen and conserved in 70% ethanol at -20°C for the genetic analyses, while the specimen was fixed for 48 h in 10% formalin, and then transferred to 70% ethyl alcohol before being sent to Universidade Estadual de Londrina (UEL) in Londrina, Paraná, Brazil, for morphological identification and cataloguing (voucher number: MZUEL 15410). The species was first identified through the examination of its external morphology (Reis 1997, Reis et al. 2005), and then confirmed by molecular analysis based on the sequence of the COI deposited in the BOLD Systems platform under catalog number (RENA002-16) (<http://www.boldsystems.org>) (Ratnasingham and Hebert 2007).

The specimen analyzed in the present study was collected in accordance with Brazilian environmental legislation, and the collection of biological sample was authorized by the Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis (IBAMA) through license number 02012.004159/2006.

Results

Megalechis thoracata can be distinguished from *M. picta* by its smaller spine in the dorsal fin, the typically larger number of rays in the anal fin (6 or, rarely, 5 vs 5 or, rarely, 4), and in particular, the coloration of this fin (Reis et al. 2005). *Megalechis thoracata* presents a whitish stripe at the base of the caudal fin, while the rest of the fin is dark or covered in black spots, while in *M. picta*, the base of the caudal fin is blackish, with accentuated dark stripes in the medial and distal regions, typically interspersed with light yellow (Tencatt et al. 2013).

The COI sequence of the specimen (RENA002-16) was 99.06% similar to that of *Megalechis thoracata* available on the BOLD platform, a percentage similarity within the intraspecific range (Hebert et al. 2003), which is consistent with the morphological diagnosis.

Discussion

While fish specimens have been collected continuously in the study area since 2011, the *M. thoracata* specimen

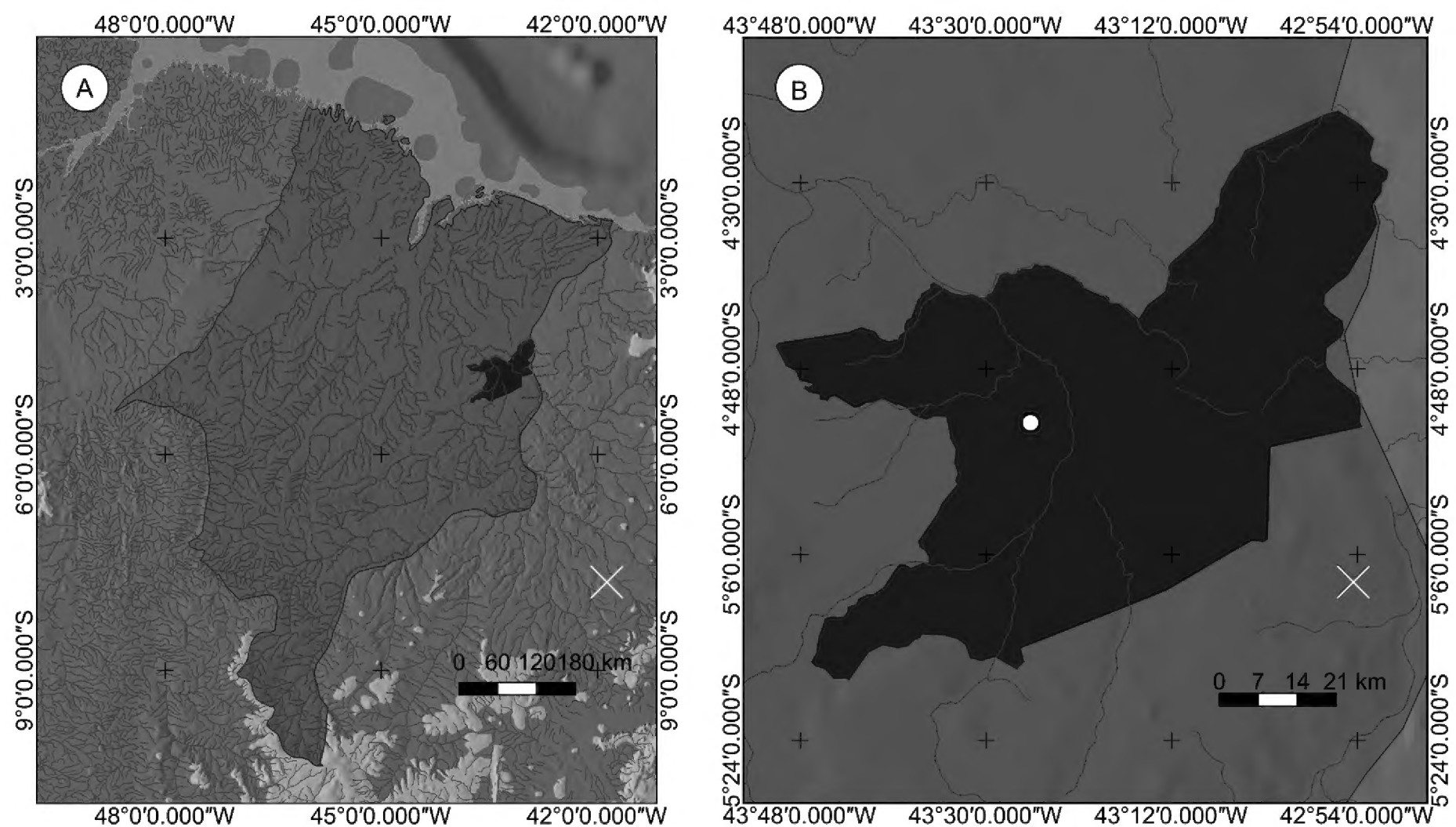


Figure 3. (A) Map of Maranhão showing the municipality of Caxias (dark blue) and (B) map of Caxias showing the approximate location of the study area (white dot) in the Inhamum Municipal Environmental Protection Area (Inhamum MEPA).

was only captured in September 2015 in the Inhamum MEPA, in the Itapecuru basin. No records of the species were obtained during previous studies in this basin (Barros et al. 2011, Fraga et al. 2012), nor in neighboring basins in the Brazilian Northeast, including those of the São Francisco (Carvalho et al. 2011), Parnaíba or Munim rivers (Ramos et al. 2014, Matavelli et al. 2015). *Megalechis thoracata* had nevertheless been recorded in the Mearim basin, by Soares (2005). The specimen described in the present study thus represents an important extension of the known distribution of the species, which is now known to occur in the Itapecuru basin.

Tencatt et al. (2013, 2015) concluded that *M. picta* was probably introduced into the upper basin of the Paraná River through its use as live bait, and it seems possible that *M. thoracata* may have been introduced into the Itapecuru basin under similar circumstances. It is still too early to determine whether *M. thoracata* can effectively colonize this basin or cause impacts to the native species of the Itapecuru River. This situation nevertheless highlights the introduction or transfer of species between basins, whether intentional or otherwise, which is becoming increasingly common, and almost always has a negative impact on the resident native species (Pelicice et al. 2014). Any intervention of this type should be controlled as effectively as possible.

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Authors' Contributions

RCL conceived, researched, acquired data and analyzed/interpreted data; MHSN collaborated in the preparation of the manuscript; JLOB identified the species and catalogued the voucher; MCB collaborated in reaching the approval for the publishable manuscript version; ECF helped in the preparation/revision of the submitted manuscript.

References

- Albuquerque AB (2012) Riacho Ponte e Área de Proteção Ambiental Municipal do Inhamum, Caxias/MA. In: Barros MC (Ed.) Biodiversidade na Área de Proteção Ambiental Municipal do Inhamum. UEMA, São Luís, 107–116.
- Barros MC, Fraga EC, Birindelli JLO (2011) Fishes from the Itapecuru river basin, state of Maranhão, northeast Brazil Brazilian. *Journal of Biology* 71 (2): 375–380. doi: <http://dx.doi.org/10.1590/s1519-69842011000300006>
- Carvalho DC, Oliveira DAA, Pompeu PS, Leal CG, Oliveira C, Hanner R (2011) Deep barcode divergence in Brazilian freshwater fishes: the case of the São Francisco River basin. *Mitochondrial DNA* 22(1): 80–86. <https://doi.org/10.3109/19401736.2011.588214>
- Eschmeyer WN, Fong JD (2017) Species by family/subfamily, version of 1 March 2017. *Catalog of Fishes*. <http://researcharchive.calacademy.org/research/ichthyology/catalog/SpeciesByFamily.asp>. Accessed on: 2017-3-26.
- Fernandes RS, Conceição GM, Brito ES, Paula-Zárate EL (2007) Diversidade Florística de Pteridófitas da Área de Preservação Ambiental do Inhamum, Caxias, Maranhão, Brasil. *Revista Brasileira de Biociências* 5 (2): 411–413.

- Ferreira E, Zuanon J, Santos G, Amadio S (2011) The fish fauna of the Parque Estadual do Cantão, Araguaia River, state of Tocantins, Brazil. *Biota Neotropica* 11 (2): 277–284. doi: <https://doi.org/10.1590/S1676-06032011000200028>
- Fraga EC, Birindelli JLO, Azevedo CAS, Barros MC (2012) A ictiofauna da Área de Proteção Ambiental Municipal do Inhamum, Caxias/MA. In: Barros MC (Ed.) *Biodiversidade na Área de Proteção Ambiental Municipal do Inhamum*. UEMA, São Luís, 107–116.
- Hebert PDN, Ratnasingham S, de Waard JR (2003) Barcoding animal life: cytochrome *c* oxidase subunit 1 divergences among closely related species. *Proceedings of the Royal Society B: Biological Sciences* 270: 596–599. <https://doi.org/10.1098/rsbl.2003.0025>
- Matavelli R, Campos AM, Vale J, Piorski NM, Pompeu PS (2015) Ichthyofauna sampled with tadpoles in northeastern Maranhão state, Brazil. *Check List* 11 (1): 1550 <https://doi.org/10.15560/11.1.1550>
- Pellicice FM, Vitule JRS, Lima Junior DP, Orsi ML, Agostinho AA (2014) A serious new threat to Brazilian freshwater ecosystems: the naturalization of nonnative fish by decree. *Conservation Letters* 7: 55–60. <https://doi.org/10.1111/conl.12029>
- Ramos TPA, Ramos RTC, Ramos SAQA (2014) Ichthyofauna of the Parnaíba river basin, northeastern Brazil. *Biota Neotropica* 14 (1): e20130039. <https://doi.org/10.1590/S1676-06020140039>
- Ratnasingham S, Hebert PDN (2007) BOLD: The Barcode of Life Data System (www.barcodinglife.org). *Molecular Ecology Notes* 7 (3): 355–364. <https://doi.org/10.1111/j.1471-8286.2007.01678.x>
- Reis RE (1997) Revision of the Neotropical catfish genus *Hoplosternum* (Ostariophysi: Siluriformes: Callichthyidae), with the description of two new genera and three new species. *Ichthyological Explorations of Freshwaters* 7: 299–326.
- Reis RE (2003) Family Callichthyidae (armored catfishes). In: Reis RE, Kullander SO, Ferraris CJ Jr (Eds) *Check List of the Freshwater Fishes of South and Central America*. Edipucrs, Porto Alegre, 291–309.
- Reis RE, Le Bail P-Y, Mol JHA, Armbruster JW (2005) New arrangement in the synonym of *Megalechis* Reis, 1997 (Siluriformes: Callichthyidae). *Copeia* 2005 (3): 678–682. <https://doi.org/10.1643/CI-04-353R>
- Soares EC (2005) *Peixes do Mearim*. 10ª edição. Volume 10. Editora Instituto Geia, São Luiz, 143 pp.
- Tencatt LFC, da Graça WJ, Pavanelli CS (2013) First record of *Megalechis picta* (Müller and Troschel, 1849) (Siluriformes: Callichthyidae) in the upper Rio Paraná basin, Brazil. *Check List* 9 (5): 1081–1083. <https://doi.org/10.15560/9.5.1081>
- Tencatt LF, Severo-Neto F, Froehlich O (2015) First record of the camboatá *Megalechis picta* (Müller & Troschel, 1849) (Siluriformes: Callichthyidae) for the Pantanal, Brazil. *Biota Neotropica* 15 (1): e20140096. <https://doi.org/10.1590/1676-06032015009614>